

CLAIMS

1. Device for enabling access to a structure above ground level, e.g. of considerable height such as a wind turbine, a rotor blade or a tower of such a wind turbine, the device comprising a part that may be lowered and/or lifted in relation to the structure (1), the device (10, 50) comprising
 - a first main part (12, 62) that is suspended by the structure (1), and
 - a second main part (14, 64) that comprises means (16, 16', 66) for carrying an object such as a tool device or means for carrying a person and that is movably connected to the first main part (12, 62).
- 5 10 2. Device according to claim 1, wherein the device (10, 50) comprises a counterweight (13) located essentially opposite the means (16, 16', 66) for carrying an object.
- 15 3. Device according to claim 1 or 2, wherein the second main part (14, 64) comprises a counterweight (13) located essentially opposite the means (16, 16', 66) for carrying an object.
- 20 4. Device according to claim 1, 2 or 3, wherein the means (16, 16', 66) for carrying an object are adjustable in relation to the second main part (14, 64).
- 5 5. Device according to claim 4, wherein the means (16, 16', 66) for carrying an object can be displaced linearly and/or rotatably in relation to the second main part (14).
- 20 6. Device according to claim 4 or 5, wherein the means (16, 16', 66) for carrying an object is connected to the second main part by means of at least one link that provides a rotatable connection.
7. Device according to one or more of claims 1 to 6, wherein the device (10, 50), e.g. the first main part is suspended by wires, lines or the like (18) from anchoring means.
- 25 8. Device according to one or more of claims 2 to 7, wherein the counterweight (13) is designed to be controlled in dependence on the position of the means for carrying an object.
9. Device according to one or more of claims 1 to 8, wherein the means for carrying an object comprises a work platform (16, 66) for one or more persons.

10. Device according to one or more of claims 1 to 8, wherein the means for carrying an object comprises seating (16') for one or possibly more persons.

11. Device according to one or more of claims 1 to 10, wherein the device and in particular the means (16, 16', 66) for carrying an object, e.g. a person, comprises control means for controlling the position of the means, e.g. the height, the angular position, the position in relation to an axis etc.

12. Device according to one or more of claims 1 to 11, wherein the first main part (12, 62) and/or second main part (14, 64) comprises a frame that may be essentially circular in shape.

10 13. Device according to one or more of claims 1 to 12, wherein the first main part (12, 62) and/or second main part (14, 64) comprises a frame having an essentially elongated shape.

14. Device according to one or more of claims 1 to 13, wherein the first main part (12, 62) may comprise a number of parts (71 – 74) that may be assembled to form different sizes and/or forms.

15 15. Device according to one or more of claims 1 to 14, wherein the first main part (12, 62) and second main part (14, 64) comprises a roller suspension (34) or a movable suspension (68, 94) for providing the movable connection.

16. Device according to one or more of claims 1 to 15, wherein the device comprises anchoring means (20, 44, 120) for fastening to the structure (1).

20 17. Device according to one or more of claims 1 to 16, wherein the device comprises elevation or hoisting means (69) for lifting and/or lowering of the device, the elevation or hoisting means comprising wires or the like (18) connected to the structure (1), e.g. to anchoring means (20, 44) on the structure.

25 18. Device according to one or more of claims 1 to 17, wherein the device (50) comprises a securing arrangement (80) for stabilizing the device to the structure (1).

19. Device according to claim 18, wherein the securing arrangement (80) comprises two securing elements (81, 82) for releasable pressing against the structure, e.g. a rotor blade.

20. Device according to claim 19, wherein the securing elements (81, 82) are inflatable.

21. Device according to claim 19 or 20, wherein the securing elements (81, 82) contract in length when inflated.
22. Device according to claim 19, 20 or 21, wherein the securing elements (81, 82) expand in width when inflated.
- 5 23. Device according to one or more of claims 19 to 22, wherein the securing elements (81, 82) are located by means of adjustable fixation means (85).
24. Device according to one or more of claims 19 to 23, wherein the securing elements (81, 82) are rotatably mounted.
- 10 25. Device according to one or more of claims 19 to 24, wherein the securing elements (81, 82) are individually inflatable.
26. Device according to one or more of claims 19 to 25, wherein the securing elements (81, 82) comprise means for supporting when they are not inflated.
- 15 27. Device according to one or more of claims 1 to 26, wherein the device comprises power means, e.g. electric motors, hydraulic and/or pneumatic means for lifting, lowering and/or displacing the parts.
28. Device according to one or more of claims 1 to 27, wherein the device comprises means for lifting and/or lowering of anchoring means (20, 44, 120) in relation to the structure.
- 20 29. Device according to one or more of claims 1 to 28, wherein the means for lifting and/or lowering anchoring means (20, 44, 120) in relation to the structure comprises means (40) for elevating using a wire (42) or the like connected to a part of the structure, e.g. the wind turbine.
30. Device according to one or more of claims 1 to 28, wherein the means for lifting and/or lowering anchoring means (20, 44, 120) in relation to the structure comprises an uplift device (112).
- 25 31. Device according to one or more of claims 1 to 30, wherein the device is adapted for performing inspection, work, repair, surface treatment etc on a rotor blade of a wind turbine.

32. Device according to one or more of claims 1 to 30, wherein the device is adapted for performing inspection, work, repair, surface treatment etc. on a tower structure of a wind turbine.

33. Device according to one or more of claims 1 to 32, wherein the device comprises a work platform (66) for carrying at least one person, the work platform being provided with an indentation (101).

34. Device according to claim 33, wherein the work platform (66) comprises protection means in the form of a roller (102) or the like placed in the indentation (101).

35. Device according to claim 33 or 34, wherein the work platform (66) comprises protection means in the form of a protection strip (103) placed on the circumference of the platform.

36. Device according to claim 33, 34 or 35, wherein the work platform (66) comprises control means for controlling the lifting/lowering and the positioning in relation to the structure.

37. Device according to one or more of claims 33 to 36, wherein the work platform (66) comprises hoisting means.

38. Device according to one or more of claims 33 to 37, wherein the work platform (66) and/or the device comprises illumination means.

39. Device according to one or more of claims 33 to 38, wherein the work platform (66) comprises shielding means.

40. Device for lifting and/or lowering of objects in connection with a wind turbine (1) or a similar construction, wherein the device (110) comprises an uplift device (112) and means for carrying at least one object supported directly or indirectly by the uplift device.

41. Device according to claim 40, wherein the at least one object comprises a device for inspection, treatment or the like of at least a part of the wind turbine (1) or the similar construction.

42. Device according to claim 40 or 41 for the establishing of an anchoring on or at a wind turbine, wherein the device comprises

- an uplift device (112) and

- a locking device (120), wherein the locking device comprises means (132, 134) for gripping in or around a part of a wind turbine, preferably in a releasable manner.

43. Device according to one or more of claims 40 – 42, wherein the device comprises means
5 for fastening of elements for use in positioning, lifting, lowering or the like of an object.

44. Device according to one or more of the claims 40 – 43, wherein the uplift device
comprises at least one element, which can be filled with an air or gas, for example helium,
and which are connectable directly or indirectly to the locking device (120).

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45. Device according to one or more of the claims 40 – 44, wherein the device comprises a
control part, possibly in the form of a wind vane (114) which, under influence of the wind,
can at least partly control the position of the device in relation to the wind direction.

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46. Device according to one or more of the claims 40 – 45, wherein the locking device (120)
comprises a frame having two parts (122, 124) that are pivotally connected at one location
(126) and connected by means of an adjustable element (140) essentially opposite (127,
128) the one location.

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47. Device according to claim 46, wherein the two frame parts (122, 124) comprise
elongated support parts (123, 125) for legs (116) of the uplift device (112).

48. Device according to one or more of the claims 40 – 47, wherein the locking device (120)
is configured in such a manner that a loading of the device will result in the transfer of a
force to the means (132, 134) for gripping in or around a part of the wind turbine.

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49. Device according to one or more of the claims 40 – 48, wherein the means (132, 134) for
gripping in or around a part of the wind turbine comprises a plurality of strips that comprise a
surface having friction-enhancing means.

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50. Unit (200) for transport and/or storage of means for performing work at a wind turbine
(1), wherein the unit comprises a container (202) or the like having a top part comprising lids
or flaps (204, 206) that may be opened and fixed in an essentially horizontal position.

51. Unit according to claim 50, wherein the container comprises two lids or flaps (204, 206),
that in total cover an area larger than the area of the top of the container.

52. Unit according to claim 50 or 51, wherein the container comprises two lids or flaps (204, 206), each one having an area substantially larger than half the area of the top of the container.

53. Unit according to claim 50, 51 or 52, wherein the container comprises two lids or flaps (204, 206), each one having an area substantially corresponding to the area of the top of the container.

54. Unit according to one or more of claims 50 to 53, wherein the container comprises an opening arrangement (208, 210, 212, 214, 216) that in an open state supports the lids or flaps (204, 206) in an essentially horizontal position.

10 55. A device for enabling access to a structure (254) above ground level by lowering and/or lifting the device in relation to the structure (254), the device comprising a first endless frame structure (251) defining an opening, wherein at least part of the first endless frame structure forms a track portion, the track portion being adapted to guide an, in relation to the track portion, movable object (257) along the track portion.

15 56. A device according to claim 55, further comprising a second endless frame structure (250) defining an opening, the second endless frame structure (250) being aligned with the first endless frame structure 251.

57. A device according to claim 55 or 56, wherein the first endless frame structure (251) forms an endless track.

20 58. A device according to any of claims 55-57, wherein the object comprises a work platform (257) adapted to carry one or more individuals.

59. A device according to any of claims 55-58, wherein the object comprises seating for one or more individuals.

25 60. A device according to any of claims 55-59, wherein the object comprises control means (291) for controlling the position of the object in relation to the track portion.

61. A device according to any of claims 55-60, wherein the first endless frame structure forms an essentially elongated structure.

62. A device according to any of claims 55-61, further comprising means (256) for lifting and/or lowering the device in relation to the structure, the lifting and/or lowering means comprising power means such as electric motors, hydraulic and/or pneumatic means for lifting, lowering and/or displacing the device in relation to the structure.

5 63. A device according to claim 62, further comprising control means (291) for controlling the lifting and/or lowering means.

64. A device according to any of claims 55-63, wherein the device is adapted to assist individuals in performing inspection, work, repair, surface treatment etc on a rotor blade of a wind turbine.

10 65. A device according to any of claims 55-64, further comprising an arrangement for aligning the structure with the opening defined by the first endless frame structure.

66. A device according to claim 65, wherein the alignment arrangement comprises a first displaceable arm having guiding means, the first displaceable arm being adapted to be brought from a first to a second position when the device is to be aligned with the structure, 15 the first displaceable arm being, in its second position, capable of bringing a catch element into contact with the structure via its guiding means, and bringing the device in approximate or complete alignment with the structure by withdrawing the catch member along the guiding means while the catch member is in contact with the structure.

67. A device according to claim 66, further comprising a second displaceable arm having 20 guiding means, the second displaceable arm being adapted to be brought from a first to a second position when the device is to be aligned with the structure, the first and second displaceable arms being, in their second position, capable of bringing a catch element into contact with the structure via their guiding means, and bringing the device in approximate or complete alignment with the structure by withdrawing the catch member along their guiding means while the catch member is in contact with the structure.

68. A device according to claim 67, wherein the first and second arms are pivotably mounted 25 on a first and a second support element, respectively.

69. A device according to claim 68, wherein the first and second support elements are pivotably mounted on an endless frame structure.

30 70. A device according to any of claims 55-69, further comprising rotatably mounted docking means arranged in the opening defined by an endless frame structure, the rotatably mounted

ducking means being adapted to fixate the structure in relation to the device when the structure has been brought into the opening defined by said endless frame structure.

71. A device according to claim 70, wherein a total of at least five rotatably mounted docking means are arranged in the opening defined by the endless frame structure.

5 72. A device according to any of claims 55-69, further comprising a docking arrangement adapted to fixate the structure in relation to the device when the structure has been brought into the opening defined by an endless frame structure, the docking arrangement comprising a pair of flexible belts, each belt being arranged between a rigid end point and a belt tightener, the belt tighteners and the end points being arranged on said endless frame
10 structure, the belt tighteners being adapted to tighten the belts by bringing them from a relaxed state to a tightened state in order to fixate the structure in relation to the device.

15 73. A device for enabling access to a structure above ground level by lowering and/or lifting the device in relation to the structure, the device comprising an endless path for individuals, the endless path defining an opening, the device further comprising an arrangement for aligning the structure with the opening defined by the endless path.

20 74. A device according to claim 73, wherein the alignment arrangement comprises a first displaceable arm having guiding means, the first displaceable arm being adapted to be brought from a first to a second position when the device is to be aligned with the structure, the first displaceable arm being, in its second position, capable of bringing a catch element into contact with the structure via its guiding means, and bringing the device in approximate or complete alignment with the structure by withdrawing the catch member along the guiding means while the catch member is in contact with the structure.

25 75. A device according to claim 74, further comprising a second displaceable arm having guiding means, the second displaceable arm being adapted to be brought from a first to a second position when the device is to be aligned with the structure, the first and second displaceable arms being, in their second position, capable of bringing a catch element into contact with the structure via their guiding means, and bringing the device in approximate or complete alignment with the structure by withdrawing the catch member along their guiding means while the catch member is in contact with the structure.

30 76. A device according to any of claims 73-75, further comprising rotatably mounted docking means arranged in the opening defined by the endless path, the rotatably mounted ducking means being adapted to fixate the structure in relation to the device when the structure has been brought into the opening defined by the endless path.

77. A device according to claim 76, wherein a total of at least five rotatably mounted docking means are arranged in the opening defined by the endless path.